AF/JFW

Attorney Docket # 5346-7CIP

Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of
Ulrich STIMMING et al.
Serial No.: 10/054,213
Filed: November 13, 2001
For: Fuel Cell with Pulsed Anode Potential

Examiner: J. Crepeau
Group Art: 1745

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APPEAL BRIEF

SIR:

This is an appeal, pursuant to 37 C.F.R. § 41.37 from the decision of the Examiner in the above-identified application, as set forth in the Final Office Action wherein the Examiner finally rejected appellant's claims. The rejected claims are reproduced in the Appendix A attached hereto. A Notice of Appeal was filed on March 23, 2006 with a Pre-Appeal Brief Request for Review. A Notice of Panel Decision from the Pre-Appeal Brief Review dated April 25, 2006 indicated that the application should proceed to the Board of Patent Appeals and Interferences.

The fee of $500.00 for filing an Appeal Brief pursuant to 37 C.F.R. § 41.20 is submitted herewith. Appellants request a one-month Extension of Time of the original shortened

statutory response period to file this Appeal Brief. A Petition for the one-month extension of time is enclosed herewith along with the fee of $120.00. Any additional fees or charges in connection with this application may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

REAL PARTY IN INTEREST

The assignee, Mannesmann AG, of applicants, Ulrich STIMMING, Kaspar Andreas FRIEDRICH, and Wolfgang UNKAUF, is the real party of interest in the above-identified U.S. Patent Application.

RELATED APPEALS AND INTERFERENCES

There are no other appeals and/or interferences related to the above-identified application at the present time.

STATUS OF CLAIMS

Claims 1, 2 were amended and claims 10-13 were added in an amendment filed October 22, 2004. Claims 1-13 have been rejected. Claims 1-13 are on appeal.

STATUS OF AMENDMENTS

There have been no Amendments filed subsequent to the Final Office Action.

SUMMARY OF THE CLAIMED SUBJECT MATTER

Independent claim 1 is directed to a fuel cell having "an anode-electrolyte-cathode unit having an anode catalyst" and "means for impressing a positive voltage on the anode of the fuel cell" (see page 4, lines 6-9, and page 7, lines 3-4, of the specification). A specific example of the means for impressing a positive voltage pulse is shown in Fig. 1 and includes a signal generator 5 and a MOSFET 6 (page 7, lines 3-4). The means for impressing a positive voltage pulse on the anode is operated so that the fuel cell voltage does not change sign and at most becomes zero so that $U\,(\text{fuel cell}) = U\,(\text{cathode}) - U\,(\text{anode}) \geq 0$ (see page 4, lines 9-11). Furthermore, the magnitude of

the voltage pulse is chosen during operation such that carbon monoxide adsorbed at the anode catalyst is oxidized (page 4, lines 12-15).

Independent claim 2 recites a "method for removing carbon monoxide from an anode catalyst of a fuel cell comprising the step of impressing at least one positive voltage pulse on the anode (see page 4, lines 6-9, and page 7, lines 3-4, of the specification). The step of impressing is performed so that "the fuel cell has a voltage that does not change sign and at most becomes zero so that U (fuel cell) = U (cathode) - U (anode) $\geq$ 0" (see page 4, lines 9-11).

Dependent claim 12 recites a "means for impressing repeated positive voltage pulses" which is shown in Fig. 1 and includes the signal generator 5 and the MOSFET 6 (page 7, lines 3-4).

GROUNDS OF REJECTION TO BE REVIEWED IN APPEAL

1. Whether claims 1-5, 8, 10, and 11 are patentable under 35 U.S.C. 102(b) over U.S. Patent No. 6,096,448 (Wilkinson)?

2. Whether claims 12 and 13 are patentable under 35 U.S.C. 103 over Wilkinson?

3. Whether claims 6, 7, and 9 are patentable under 35 U.S.C. 103 over Wilkinson in view of Applicants' Admitted Prior Art?

ARGUMENT

Independent claim 1 is directed to a fuel cell and recites "an anode-electrolyte-cathode unit having an anode catalyst" and "means for impressing a positive voltage pulse on the anode, wherein the fuel cell has a voltage that does not change sign and at most becomes zero so that U (fuel cell) = U (cathode) - U (anode) $\geq$ 0". Independent claim 2 is directed to a method for

removing carbon monoxide from an anode catalyst of a fuel cell and includes the step of "impressing at least one positive voltage pulse on the anode, wherein the fuel cell has a voltage that does not change sign and at most becomes zero so that U (fuel cell) = U (cathode) - U (anode) ≥ 0".

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Wilkinson fails to disclose the recitation "impressing at least one positive voltage pulse on the anode", as expressly recited in each of independent claims 1 and 2. In contrast, Wilkinson discloses only causing a fuel starvation condition at the anode.

Wilkinson discloses a method and apparatus for operating an electrochemical fuel cell with periodic fuel starvation. Fuel starvation is defined in Wilkinson as a reduction in fuel supply to the anode electrocatalyst which results in an increase in the anode potential. Wilkinson discloses three embodiments for achieving fuel starvation. In a first embodiment, the delivery of fuel to the anode of the fuel cell is periodically interrupted using a valve or pump (see col. 5, lines 13-21, in Wilkinson). In a second embodiment, a flow of fuel free fluid is periodically brought to the anode (see col. 5, lines 40-50). In a third embodiment, a switch periodically connects a transient electrical load to the fuel cell which draws electrical power greater than that which can be produced by the fuel supply so that the fuel cell becomes fuel starved (see col. 4, lines 23-35; and col. 5, lines 51-60).

The Examiner alleges that the increase in anode potential due to fuel starvation discloses "impressing at least one positive voltage pulse on the anode", as expressly recited in independent claims 1 and 2. Although both the fuel starvation at the anode disclosed by Wilkinson and the recited step and means for impressing achieves the result of raising the anode potential, Wilkinson and the claimed invention describe two totally different ways of achieving the same result. Wilkinson is wholly devoid of any disclosure, teaching or suggestion for impressing a positive voltage pulse on the anode. Accordingly, independent claims 1 and 2 are not anticipated by Wilkinson under 35 U.S.C. §102.

Furthermore, Wilkinson achieves the result of raising the anode potential without the need for means for impressing a positive voltage pulse to the anode. In contrast, Wilkinson manipulates the fuel supply to the anode using the already existing fuel supply controller. Since Wilkinson teaches how to achieve the same result as the present invention using a pre-existing part of the fuel cell, Wilkinson provides no motivation for providing the means for impressing a positive voltage pulse to the anode. Therefore, independent claim 1 and 2 are also not rendered obvious by Wilkinson under 35 U.S.C. §103

For the foregoing reasons, it is respectfully submitted that Wilkinson fails to establish a case of anticipation or obviousness with regard to the subject matter recited in claims. The Final Rejection of the independent claims 1 and 2 should be reversed. Furthermore, the rejections of dependent claims 3-13 should also be reversed for the same reasons.

CONCLUSION

For the foregoing reasons, it is respectfully submitted that appellants' claims are not anticipated by or obvious over Wilkinson and are, therefore, patentable over the art of record, and the Examiner's rejections should be reversed.

Respectfully submitted,
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CLAIMS APPENDIX

1. (previously presented) A fuel cell, comprising:

an anode-electrolyte-cathode unit having an anode catalyst; and

means for impressing a positive voltage pulse on the anode, wherein the fuel cell has a voltage that does not change sign and at most becomes zero so that U (fuel cell) = U (cathode) - U (anode) ≥ 0.

2. (previously presented) A method for removing carbon monoxide from an anode catalyst of a fuel cell comprising the step of impressing at least one positive voltage pulse on the anode, wherein the fuel cell has a voltage that does not change sign and at most becomes zero so that U (fuel cell) = U (cathode) - U (anode) ≥ 0.

3. (original) A method as defined in claim 2, including impressing repeated positive voltage pulses on the anode.

4. (original) A method as defined in claim 2, further including using reformed alcohols as fuel.

5. (original) A method as defined in claim 2, further including using reformed hydrocarbons as fuel.

6. (original) A method as defined in claim 4, including reforming the alcohols internally in the fuel cell.

7. (original) A method as defined in claim 5, including reforming the hydrocarbons internally in the fuel cell.

8. (original) A method as defined in claim 2, wherein a direct conversion of alcohols takes place at the anode.

9. (original) A method as defined in claim 2, wherein a direct conversion of hydrocarbons takes place at the anode.

10. (previously presented) The fuel cell of claim 1, wherein a magnitude of the voltage of the voltage pulse is chosen during operation to oxidize carbon monoxide adsorbed at the anode catalyst.

11. (previously presented) The method of claim 2, wherein a magnitude of the voltage of the voltage pulse is chosen during operation to oxidize carbon monoxide adsorbed at the anode catalyst.

12. (previously presented) The fuel cell of claim 1, wherein said means for impressing a positive voltage pulse comprises means for impressing repeated positive voltage pulses on the anode, wherein a time period between pulses is varied in response to load changes.

13. (previously presented) The method of claim 3, wherein said step of impressing repeated positive voltage pulses comprises varying a time period of the repeated positive voltage pulses in response to load changes.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None